

Banana Pseudostem TEMPO-oxidized nanofibers as a Reinforcement for TMS 98/0505 Cassava Thermoplastic Starch Biopolymers

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INTRODUCTION

- ✓ Blending starch with polysaccharides such as nanocellulose (NC) enhances their mechanical, thermal and barrier properties.
- ✓ TEMPO-mediated oxidation of NC enhances its compatibility with other polymer matrices such as starch (Kassie et al., 2024).
- ✓ In this study TMS 98/0505 cassava starch (TCS) films reinforced with 3, 6 and 9 wt.% banana pseudostem cellulose nanofibers (TNF) were produced by casting method.

METHODS

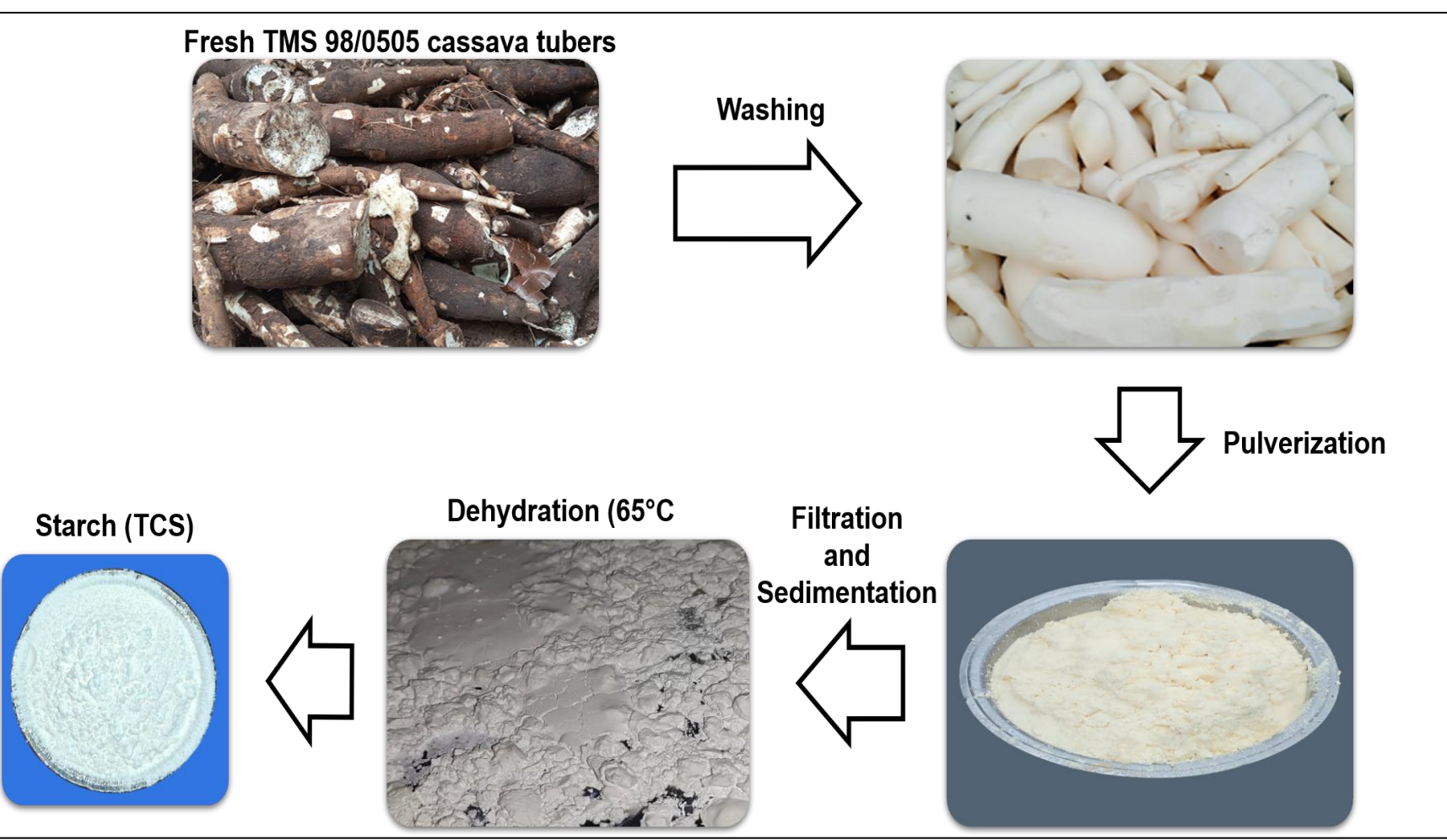


Fig. 1 TCS Extraction

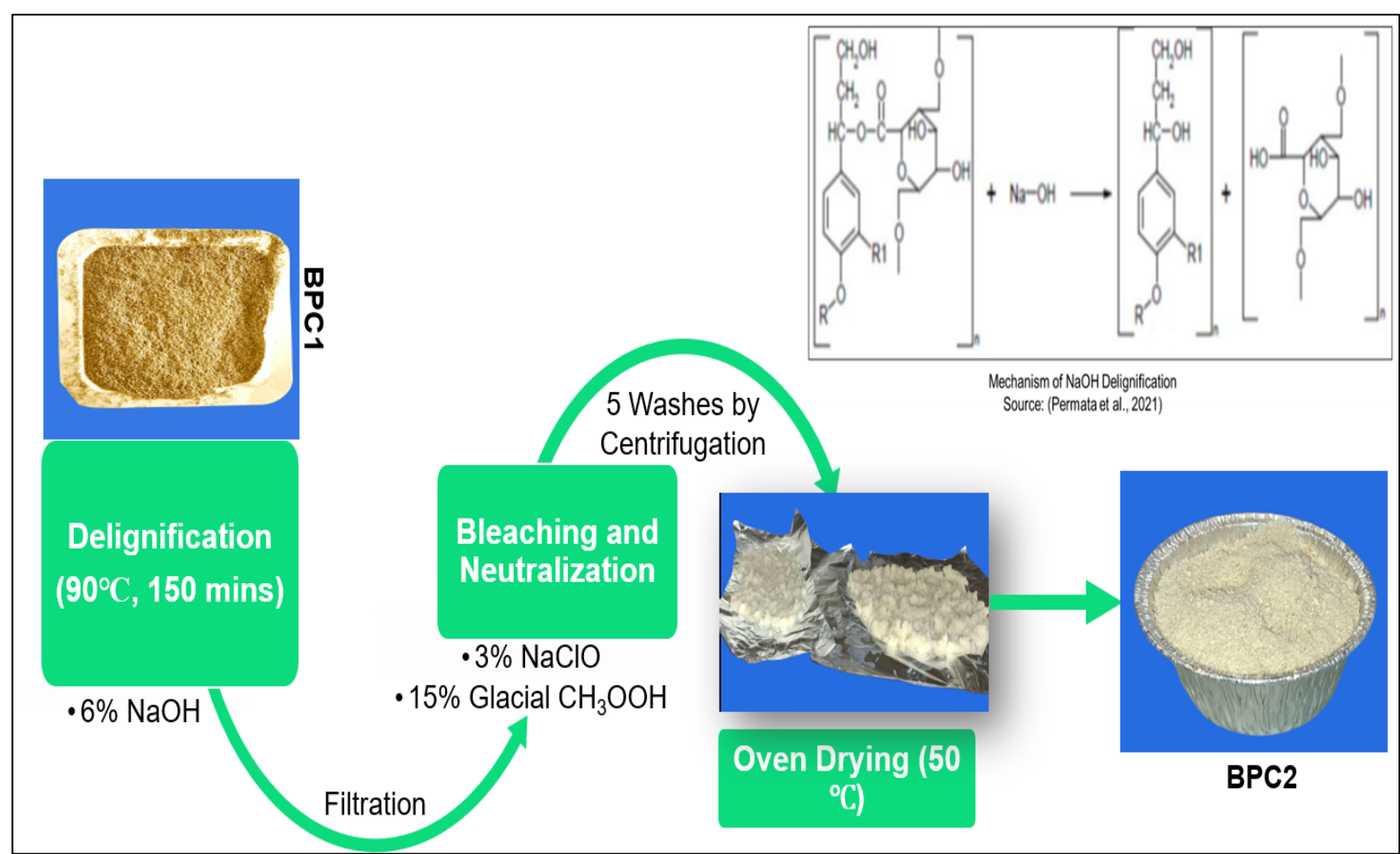


Fig.2 Isolation of NC

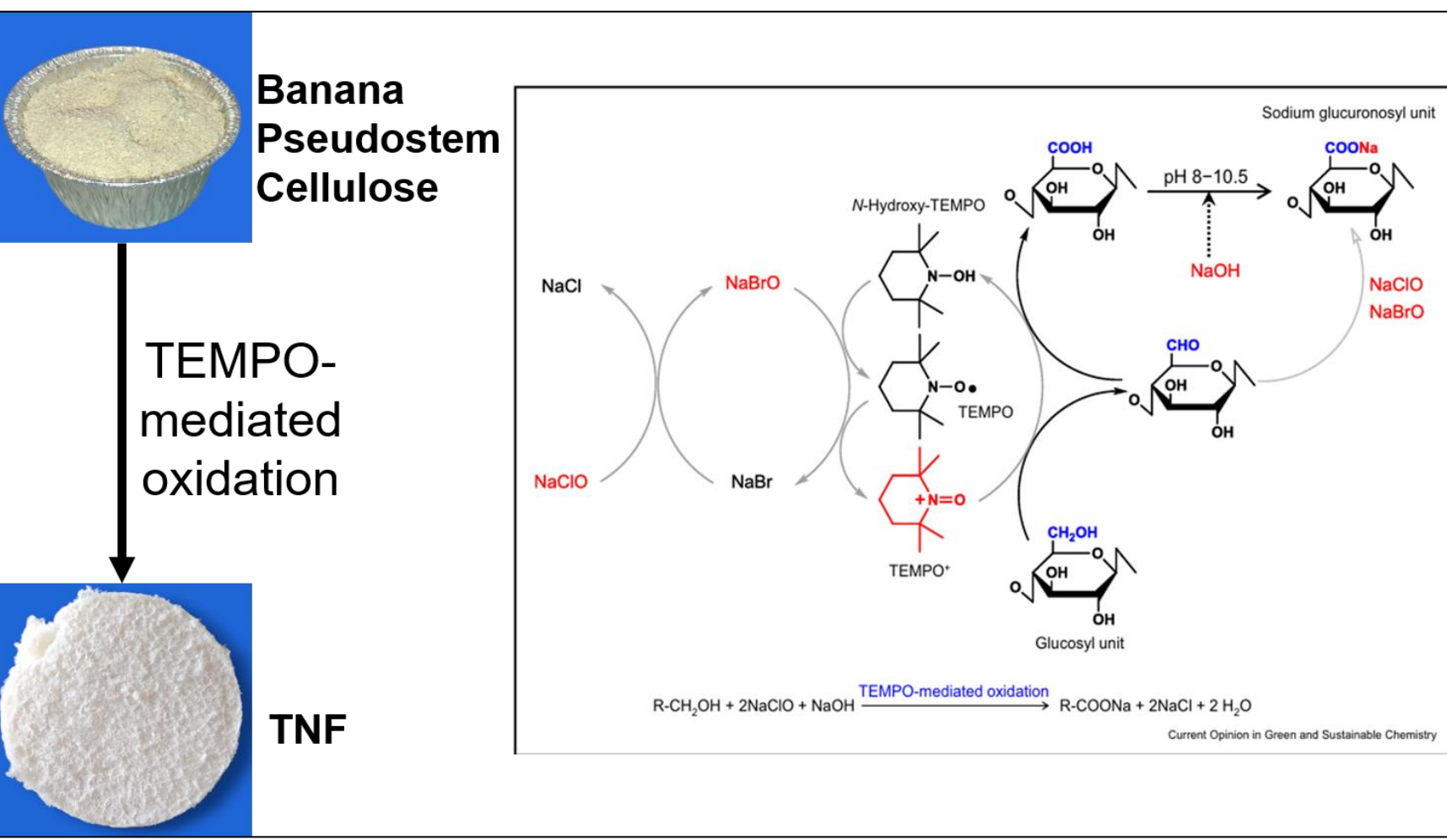


Fig. 3 Modification of NC to TNF

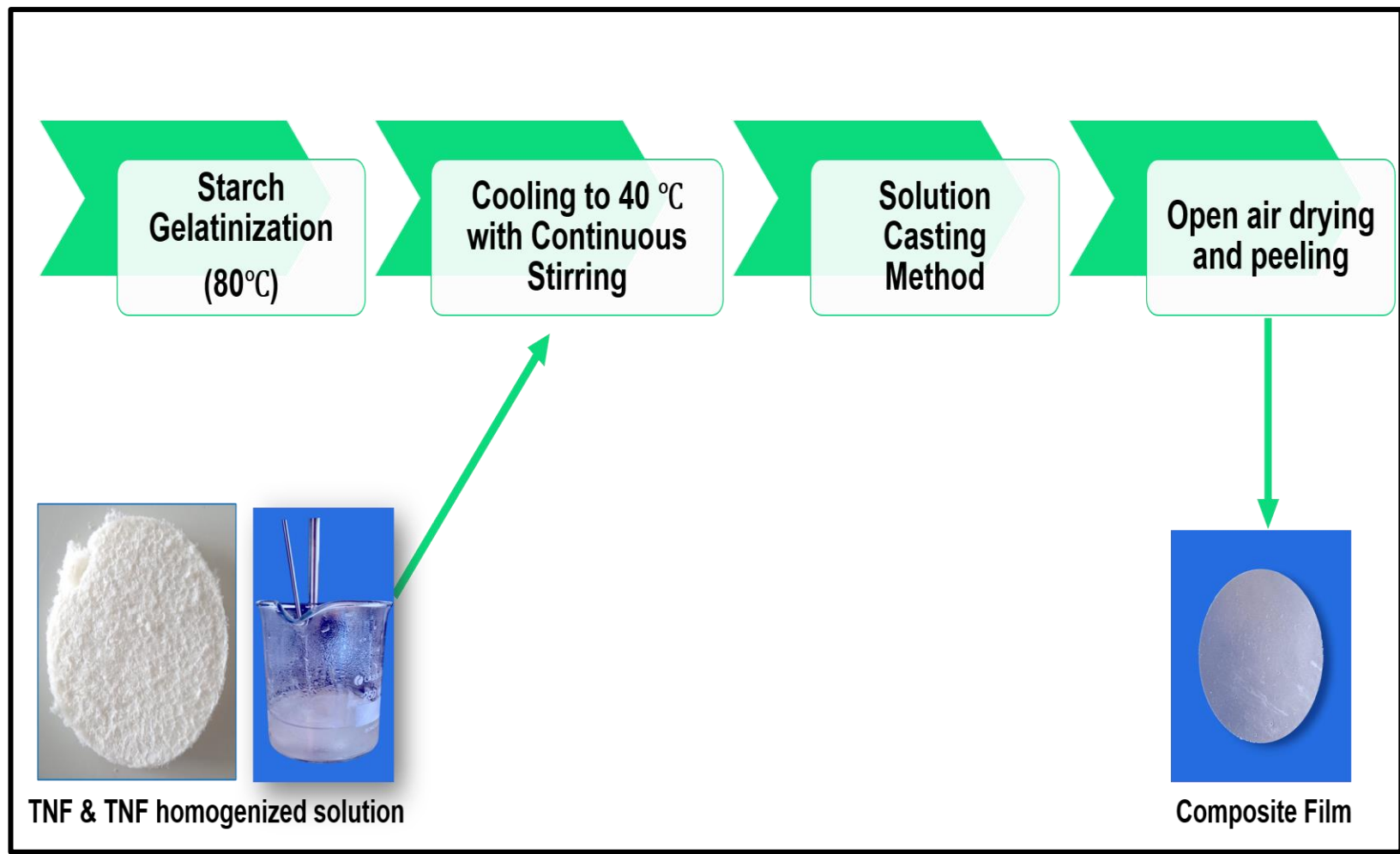


Fig.4 Films Casting

RESULTS

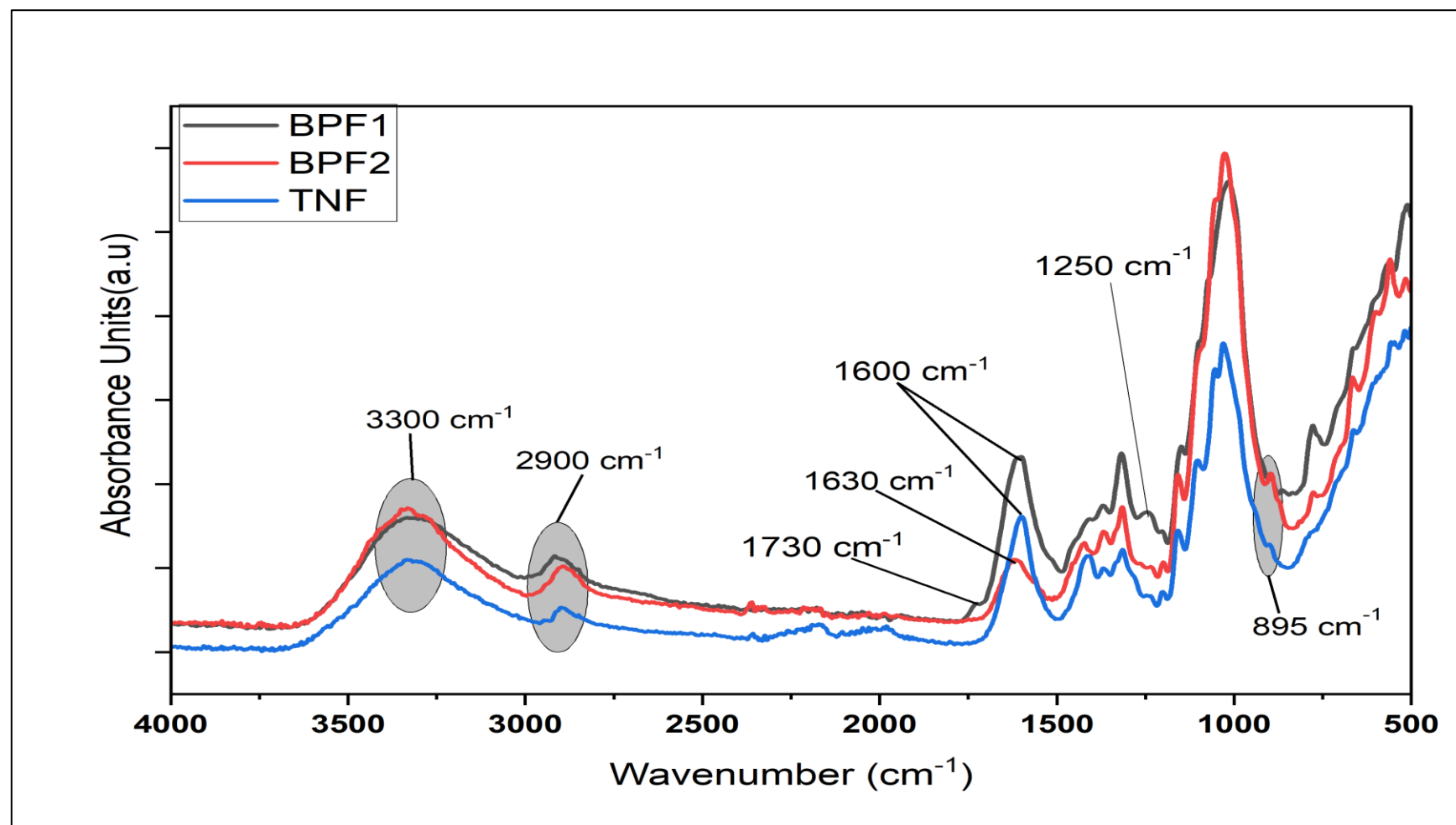


Fig. 5 ATR-FTIR Spectra of TNF

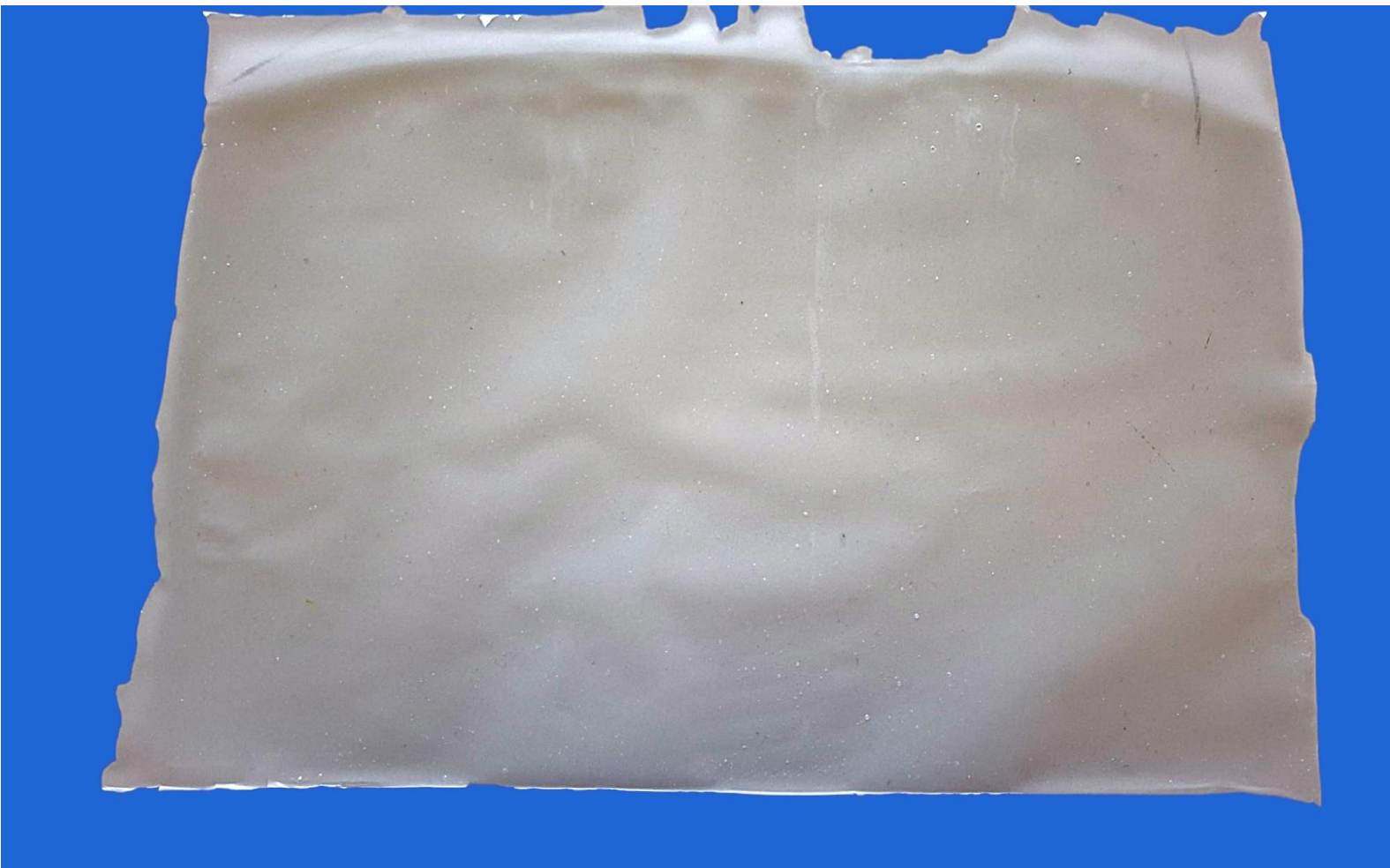


Fig.6 TCS-TNF Composite Film

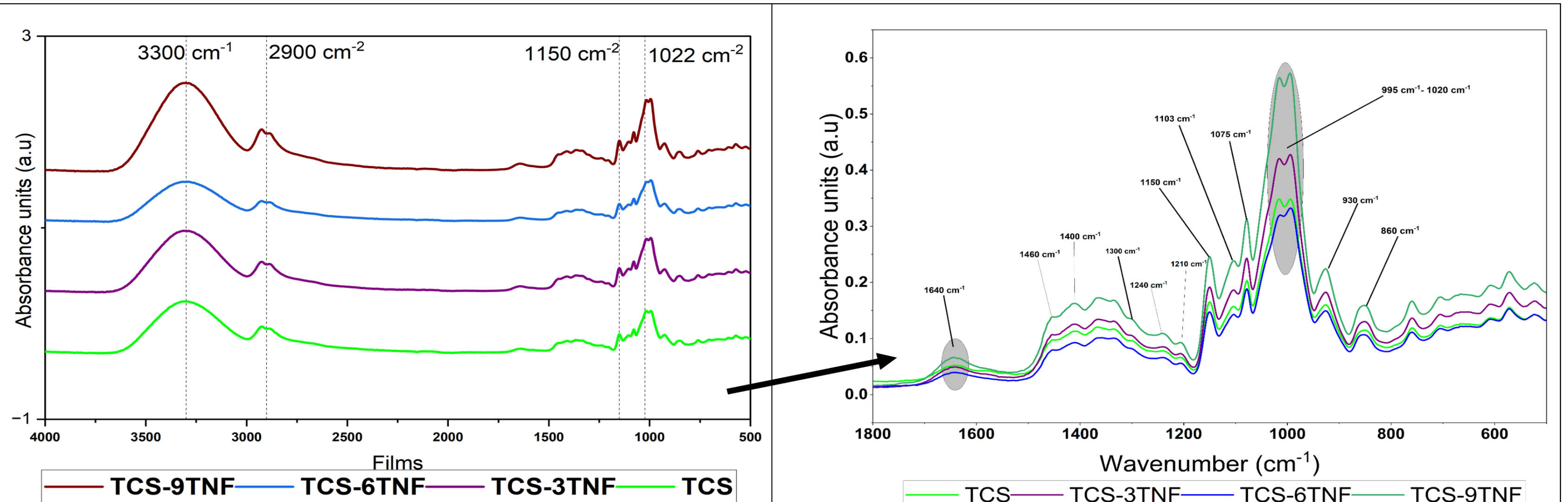


Fig. 7 ATR-FTIR Spectra of the composite films

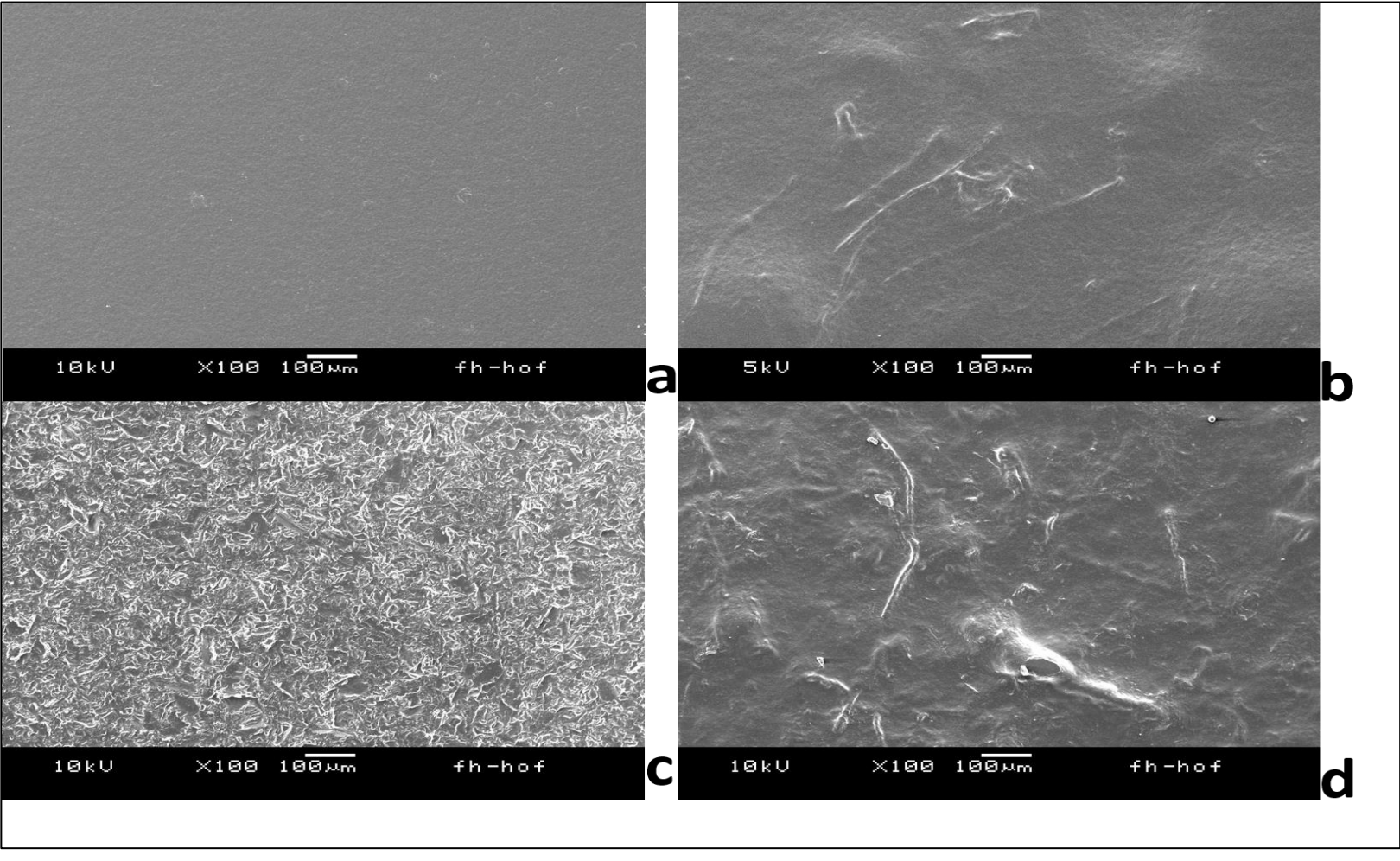


Fig. 8 Morphology by SEM

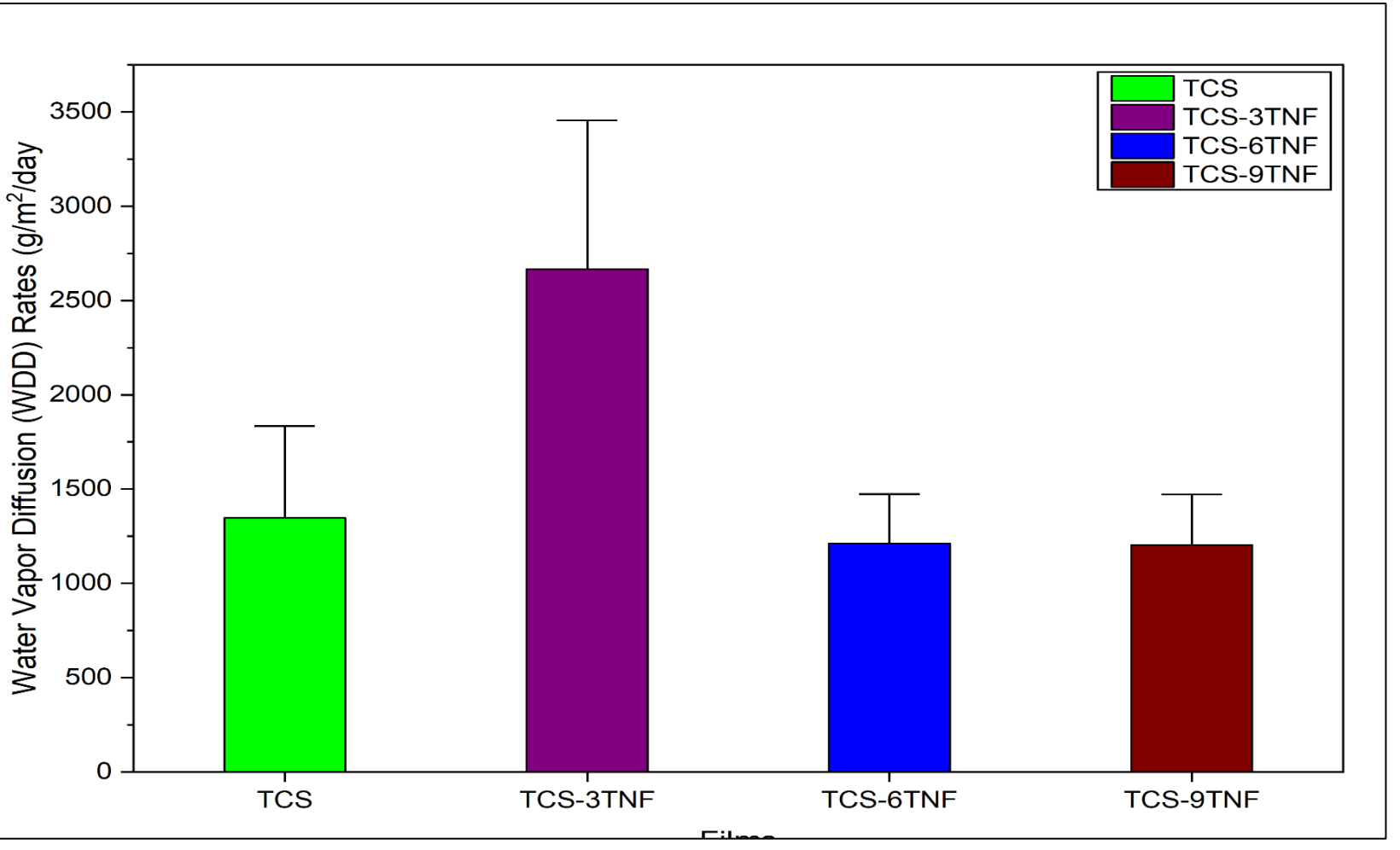


Fig. 9 Water vapor diffusion rates

RESULTS

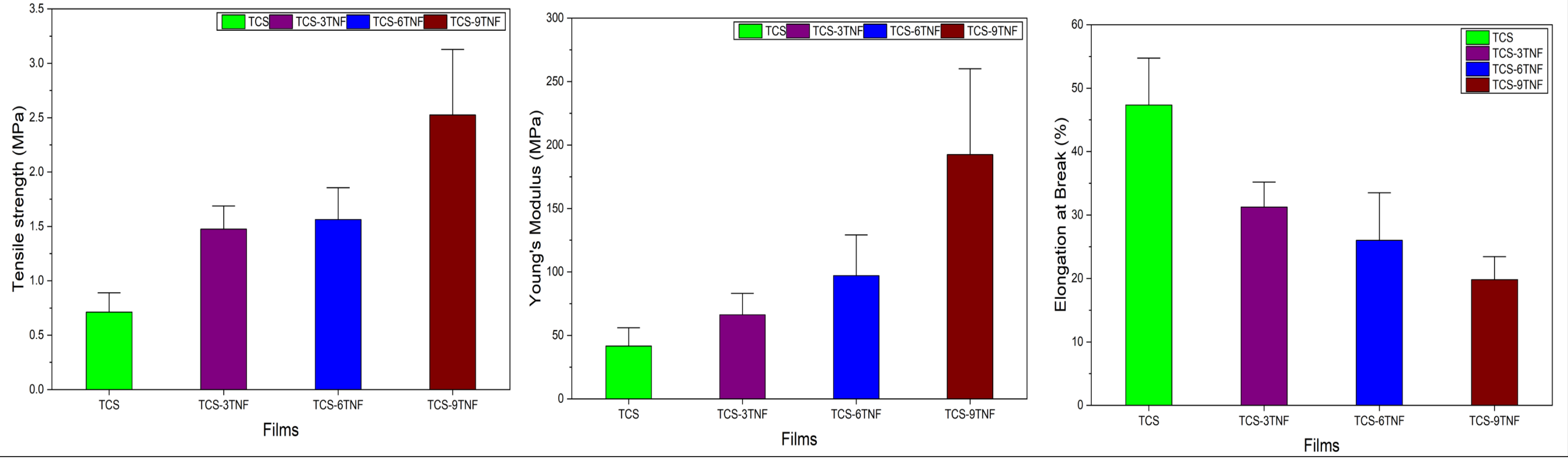


Fig 10: Mechanical Properties (TS, YM, and EAB respectively)

Table 1: Thermal Properties

Sample ID	T _{onset} (°C)	T _{max} (°C)	T _g (°C)	Δ _{CP} (J/g.k)
TCS-pure	274.4	300.6	132.0	1.274
TCS-3TNF	274.7	300.1	149.4	1.549
TCS-6TNF	275.5	300.0	144.5	0.725
TCS-9TNF	278.0	300.3	131.9	1.361

CONCLUSION

✓ Oxidized cellulose nanofibers significantly improved film's mechanical properties, thermal stability and water vapor barrier properties.

REFERENCES

Kassie, B. B., Daget, T. M., & Tassew, D. F. (2024). Synthesis, functionalization, and commercial application of cellulose-based nanomaterials. International Journal of Biological Macromolecules, 278, 134990. <https://doi.org/10.1016/j.ijbiomac.2024.134990>